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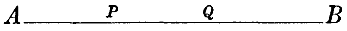


$P=S=\int_{-a}^{l-a}xdx=\frac{1}{2}[l^2-2al]$. $\frac{dS}{da}=-2l=0$ for minimum, *i. e.*, $l=0$ which is an absurdity. The sum of squares a minimum *will* hold in this case.

V. The same proof that Prof. Zerr gives will hold for *any* power of the distance, which proposition is highly improbable.

31. **Proposed by F. P. MATZ, D. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Penn.**

In order that a vertical cylindric stalk may be severed by a blow of minimum force, the stalk must be struck at what inclination by a sharp wedge-shaped blade?

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science in Texarkana College, Texarkana, Ark.-Tex.

Let $f\phi(\theta)$=the force necessary to sever a unit of area, where θ is the inclination to the horizon. Let r=radius of stalk.

$\therefore$ The area of section made in cutting is $\pi r^2\sec\theta$, the area of an ellipse with semi-axes r and $r\sec\theta$. $\therefore \pi r^2 f\sec\theta\phi(\theta)$=a minimum. This can be made a minimum when $\phi(\theta)$ is known. If $f\phi(\theta)=a+b\cos^2\theta$, then $\theta=\sin^{-1}\sqrt{1=\frac{a}{b}}$.

32. **Proposed by S. H. WRIGHT, M. D., A. M., Ph. D., Penn Yan, New York.**

Intermittent reflections of flashes of light on a clear sky after dark, indicated a storm was progressing *below* the horizon. Refraction of 34′ on the horizon, brought the upper edge of the storm-cloud up to the horizon, and was just visible. How far off was the storm if the cloud was one mile above the earth?

I. **Solution by the PROPOSER.**

In the plane triangle ABC, let C be the center of the Earth, A the place of the observer, and B that of the cloud. Then AC=Earth's mean radius=3959 miles, $=b$, $BC=3960$ miles, $=a$, $AB=c$, the required distance. The angle BAC=the nadir distance of the cloud, being $90^\circ-34'=89^\circ26'=A$. Then

$\sin B=\frac{b\sin A}{a}$. $\therefore$ $B=88^\circ35'36''$, and $180^\circ-(A+B=1^\circ58'24''=C$, and

$$c=\frac{b\sin C}{\sin B}=\frac{a\sin C}{\sin A}=136.367 \text{ miles.}$$

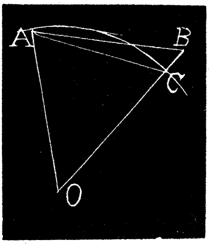
II. **Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science in Texarkana College, Texarkana, Ark.-Tex.**

Let A be the position of the observer, B the cloud, O the center of the earth, R=mean radius of the earth=3958 miles.

$$\therefore\ AC=2R\sin\tfrac{1}{2}AOC.\quad \angle ACB=\frac{\pi}{2}+\tfrac{1}{2}AOC,\quad \angle BAC=\tfrac{1}{2}AOC-34'.$$

$$\therefore AC = \frac{BC\cos(AOC-34')}{\sin(\frac{1}{2}AOC-34')} \ldots\ldots\ \ldots\ldots\ldots\ldots(1).$$

$$AB = \frac{BC\cos\frac{1}{2}AOC}{\sin(\frac{1}{2}AOC-34')} \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2).$$



$BC=1$ from (1). $\quad 2R\sin\frac{1}{2}AOC = \dfrac{\cos(AOC-34')}{\sin(\frac{1}{2}AOC-34')}$.

$\therefore \cos(AOC-34') = \dfrac{(1+R)\cos34'-1}{R+1}$. $\therefore$ $AOC = 1^\circ 58' 16''$. From (2) $AB = 136.778$ miles.

Errata. On page 56, second line from top, for "$-2562Z^3$" read $-256Z^3$; sixth line from top for "$Z=2.750413$" read $Z=2.750458368$, and for "$WR=1.5248$" read $WR=1.2963390864$; and in Note, second line from bottom, for "$z=WR$" read $x=WR$.

PROBLEMS.

38. Proposed by S. H. WRIGHT, M. D., A. M., Ph. D., Penn Yan, New York.

In latitude $42^\circ 30'$ north$=\lambda$, at what angle with the horizon, will the sun rise, its declination$=22^\circ$ north$=\delta$?

39. Proposed by SETH PRATT, C. E., Assyria, Michigan.

The pendulum of a clock which gains 6 seconds in 1 hour and 13 minutes, makes 6000 vibrations in 1 hour and 9½ minutes. What is the length of the pendulum? And what length should it have to keep true time?

◆

QUERIES AND INFORMATION.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

The Origin of π.—At least from the time of Archimedes π has stood for the number expressing how many times the diameter the circumference is. It is the initial letter of the Greek word περιφέρεια, meaning periphery. If the diameter is taken as a unit, then π stands for the periphery, or circumference. This is in reply to query of Lottie Smith in December Number.

Benj. F. Yanney,
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